

AI1110 Assignment I (ICSE Class 10 2019)

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Question 2(b): prove that

$$(\csc \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta) = 1$$

solution: Given that in the equation, RHS=1.

we have to show LHS = RHS, i.e 1.

$$\mathbf{LHS} = (\csc \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta)$$

we know that,

$$\csc \theta = \frac{1}{\sin \theta} \quad (1)$$

$$\sec \theta = \frac{1}{\cos \theta} \quad (2)$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{1}{\cot \theta} \quad (3)$$

$$\sin^2 \theta + \cos^2 \theta = 1 \quad (4)$$

from eqns 1,2, 3,4

$$LHS = \left(\frac{1}{\sin \theta} - \sin \theta \right) \left(\frac{1}{\cos \theta} - \cos \theta \right) \left(\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \right)$$

$$LHS = \left(\frac{1 - \sin^2 \theta}{\sin \theta} \right) \left(\frac{1 - \cos^2 \theta}{\cos \theta} \right) \left(\frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cos \theta} \right)$$

$$LHS = \left(\frac{\cos^2 \theta}{\sin \theta} \right) \left(\frac{\sin^2 \theta}{\cos \theta} \right) \left(\frac{1}{\sin \theta \cos \theta} \right)$$

$$LHS = \left(\frac{\sin^2 \theta \cos^2 \theta}{\sin^2 \theta \cos^2 \theta} \right)$$

$$LHS = 1 = RHS$$

$$\boxed{\therefore LHS = RHS}$$

Hence proved that $(\csc \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta) = 1$